## ANTIMONY COMPOUNDS

Antimony compounds are federal hazardous air pollutants and were identified as toxic air contaminants in April 1993 under AB 2728.

CAS Registry Number: Antimony: 7440-36-0 Sb
Antimony trioxide: 1309-64-4 $Sb_2O_3$

Molecular Formula: Sb
$O_3Sb_2$

Antimony is a silver-white shiny, hard, brittle metal. It occurs as a scale-like crystalline structure or dark gray, shiny powder. There are two stable naturally-occurring isotopes as well as 20 artificial radioactive isotopes and two allotropes (yellow crystals and amorphous black modifications). It is insoluble in water and acids, but is soluble in hot sulfuric and hydrochloric acids. Antimony forms salts including the chlorides, sulfides, and fluorides. It has low thermal conductivity, is combustible, and is a semiconductor (Sax, 1987; Merck, 1989).

Antimony trioxide appears as white, polymorphic crystals. It is slightly soluble in water and soluble in potassium hydroxide and dilute hydrochloric, nitric, and sulfuric acids (Sax, 1987; Merck, 1989).

**Physical Properties of Antimony and Antimony Trioxide**

Synonyms for antimony: antimony black; regulus antimony; CI 77050; stibium

Synonyms for antimony trioxide: antimony oxide; antimony peroxide; antimony white; antimony sesquioxide; CI pigment white 11; dechlorane-a-o; diantimony trioxide; flowers of antimony

| | Antimony | Antimony Trioxide |
|---|---|---|
| Valence: | 3,5 | |
| Atomic Number: | 51 | |
| Molecular Weight: | 121.75 | 291.52 |
| Boiling Point: | 1635 °C | 1425 °C |
| Melting Point: | 630 °C | 655 °C |
| Density/Specific Gravity: | 6.684 at 25 °C | 5.67 |
| Vapor Pressure: | 1 mm Hg at 886 °C | |

(HSDB, 1991; Merck, 1989; Sax, 1987; Sax, 1989)

## SOURCES AND EMISSIONS

A. Sources

Antimony is used in the manufacture of alloys with tin, lead, and copper, and in the compounding of rubber and fireworks (HSDB, 1991). As a hardening alloy, it is used for storage batteries, bullets, cable sheaths, bearing metal, type metal solder, collapsible tubes, foil, and sheet and pipe metal (Sax, 1987). It is combined with chlorides as coloring agents and as catalysts, and with fluorides in organic synthesis and pottery manufacture (Proctor et al., 1991).

Antimony trioxide is used in the manufacture of tartar emetic, as a paint pigment in enamels, as a glass decolorizer, and in flame proofing canvas, textiles, paper and plastics (Merck, 1989; Sax, 1987). Antimony trioxide is also manufactured in California (SRI, 1993). The primary sources that have reported emissions of antimony compounds in California are miscellaneous plastics manufacturing, petroleum products, and fabricated structural metal products manufacturing (ARB, 1997b).

B. Emissions

The total emissions of antimony compounds from stationary sources in California are estimated to be at least 90 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Antimony occurs in ores such as stibnite, kermasite, tetrahedrite, livingstonite, and jamisonite. Antimony trioxide is found in ores such as senarmontite, valentinite, exitelite, and weisspiessglanz (Merck, 1989). The earth's crust contains about 0.2 to 1 milligram per kilogram (mg/kg) and seawater about $2 \times 10^{-4}$ mg/kg. It is found mainly as sulfides and oxides as well as the native metal, and 114 minerals containing antimony are known (HSDB, 1991).

## AMBIENT CONCENTRATIONS

Antimony and its species are routinely monitored by the statewide Air Resources Board air toxics network. The network's mean concentration of antimony (including its species) from January 1996 through December 1996 is estimated to be 2.8 nanograms per cubic meter (ARB, 1997c).

## INDOOR SOURCES AND CONCENTRATIONS

In a field study conducted in southern California, investigators collected particles ($PM_{10}$) inside 178 homes and analyzed the particle samples for selected elements, including antimony. Two consecutive 12-hour samples were collected inside and immediately outside each home.

Antimony was present in measurable amounts in less than 10 percent of the samples (Clayton et al., 1993).

## ATMOSPHERIC PERSISTENCE

Antimony compounds are expected to be particle-associated in the atmosphere, and hence subject to wet and dry deposition. The average half-life for particles and particle-associated chemicals in the troposphere is estimated to be approximately 3.5 to 10 days (Balkanski et al.,1993).

## AB 2588 RISK ASSESSMENT INFORMATION

Although antimony compounds are reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

## HEALTH EFFECTS

Probable routes of human exposure to antimony compounds are inhalation, ingestion, and dermal contact (U.S. EPA, 1994a).

Non-Cancer: Short-term exposure to antimony caused irritation of skin, eyes, and respiratory tract. Antimony metal dust and fumes are absorbed from the lungs into the blood stream. Antimony trioxide causes a severe skin rash with pustules around the sweat and sebaceous glands known as "antimony spots" (Sittig, 1991; U.S. EPA, 1994a). Long-term inhalation exposure causes respiratory effects such as inflammation of the lungs, chronic bronchitis, and chronic emphysema (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has established an oral Reference Dose (RfD) for antimony of 0.0004 milligrams per kilogram per day based on decreased longevity and changes in blood glucose and cholesterol in rats. The U.S. EPA has not established a Reference Concentration (RfC) (U.S. EPA, 1994a).

One limited study has reported that women exposed to antimony via inhalation in the workplace showed an increased incidence of spontaneous abortions, and adverse reproductive effects, including disturbances in the menstrual cycle (U.S. EPA, 1994a).

Cancer: Results from human studies have been inconclusive regarding antimony exposure and cancer. Lung tumors were found in rats exposed by inhalation to antimony trioxide. The U.S. EPA has not classified antimony as to its potential carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has placed antimony trioxide in Group 2B: Possible human carcinogen, and antimony trisulfide in Group 3: Not classifiable (IARC, 1989a). The State of California has determined under Proposition 65 that antimony oxide (antimony trioxide) is a carcinogen (CCR, 1996).